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Statement of

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before the

Subcommittee on Independent Offices
Committee on Appropriations
United States Senate

Mr. Chairman and Members of the Subcommittee:

I appreciate the opportunity today to present President Johnson's FY 1967 budget recommendation for the NASA program.

The appropriation request before you totals $5.012 billion, $163 million less than was appropriated to NASA last year. This budget has been carefully drawn by the President to reflect total National requirements. For NASA this is a particularly stringent budget. We are mid-way through a 10-year effort to achieve pre-eminence in all fields of aeronautics and space. This budget is less than we need to carry out this effort with greatest efficiency and minimum risk. Every expenditure that can be deferred until 1968 without causing gaps in our activity has been deferred. This budget provides for a continuation of our on-going efforts and a few long lead-time items for the post-Apollo period. It provides no alternate or back-up vehicles.

The NASA record of success in carrying out its program has been built on an imaginative use of limited resources, a decentralized management structure with strong local program and project leadership, and dedication of both NASA and contractor personnel. One of the greatest strengths our Nation has drawn from our space activity has been the clear showing for all the world to see that we can do the tasks we set for ourselves. That we have this capability is no longer in doubt. We have put it on view for all the world to see. The world knows today that the United States can carry out space missions of extreme complexity requiring long lead times, can hold its position in a demanding competition, and can forge ahead simultaneously in both aeronautics and space and in those advanced electronic and other technologies of which space is the leading symbol.

I do not wish to give the impression, however, that we are the unchallenged masters of this new environment or that we have come to a time when we can safely rest on our oars. Quite the contrary. Last year I answered a question of the House Space Committee as to whether we would be able to close the gap between the USSR and ourselves by saying that we could

not at the budget levels recommended. This year, I must repeat that the gap is still there and that this budget will not close it. We are as much as two years behind the Soviet Union in certain important aspects of space power. In the year just passed, 1965, they launched 52 Cosmos satellites; successfully orbited a three-man spacecraft; demonstrated a communications satellite capability with two Molniya spacecraft; and orbited the heaviest payload by anyone in the world to date, indicating they have developed a new launch vehicle with some 2½ to 3 million pounds of thrust. Since the beginning of 1966 they have achieved a successful soft-landing on the Moon, have put a spacecraft in orbit around the Moon, and they have reached Venus with two probes.

The Soviet program shows every evidence of a continuing major commitment to long-term, large-scale operations in space. There is little room for doubt that they are rapidly moving toward an increased frequency of manned and unmanned flights using larger and more complex vehicles. Their capabilities will soon reach a point where they could expect success in an attempt to land men on the Moon. The massive Soviet commitment to a rapid build-up and a long-term program underlines the

importance they attach to advancing their space capabilities. The U.S. faces the hard fact that it will require an increasing effort initiated no later than FY 1968 and vigorously pushed in the years after our Apollo lunar landing to prevent them from forging ahead as the unchallenged leader in space.

The program we began presenting to you in 1961, and have elaborated in each succeeding year, was intended to meet fierce competition and to end up ahead. It was also intended to give us a number of options in space from which we could choose those offering the greatest advantages at the least cost. The competition is still fierce and we are not yet able to feel assurance that we will end up ahead in the option areas where the Russians are developing their strongest potential. A five billion dollar budget level in the years ahead will not be adequate to develop and utilize the options we are now in the final stages of developing. Many of these show clear indications of usefulness far beyond their cost.

In my view, the main question which this Committee must consider as it takes up the 1967 budget is whether we can or will continue to meet the challenges and pursue the opportunities opening up in space. The authorization request for 1967

totals $5,012,000,000 and represents a program of careful structure and balance. It represents also the need the President felt to defer every item that can go over to FY 1968. The outstanding characteristic of this NASA budget is its austerity, which is also the characteristic of the entire federal budget.

Along with austerity, the NASA authorization request also reflects the President's determination to provide suffificent resources to hold open for another year and not to foreclose the major decisions on future programs where failure to apply resources this year would make it impossible to act effectively next year. Most of these relate to whether to make use in 1970 and beyond of the space operational systems, space know-how, and facilities we have worked so hard to build up, or to begin their liquidation. The FY 1967 budget is designed to maintain at a minimum level the studies and long lead-time procurement related to those decisions.

In adjusting to this budget, NASA has had to face difficult problems and make hard decisions. We have given up, for this year, the opportunity to start important new projects. We have obtained the best advice of the scientific community as to the directions in which we should focus our capabilities. Promising

areas of research and development will operate at minimum support levels.

The budget we are presenting balances to the best of our ability four essential priorities, priorities which we rank together as the core of our program in aeroanutics and space:

- The need to develop a capability for major space flight operations that will include a manned lunar landing in this decade.
- The need to continue those important, on-going projects in space sciences and space applications that have already made such valuable contributions to our fundamental understanding of the universe and to the use of space systems for human benefit.
- The need to preserve forward movement on a broad front of advanced research and technology that is fundamental to our future capability in aeronautics and space, and thus to our National power.
- The need to take a number of definite steps now to avoid an otherwise certain gap in the near future in our space activities.

Within the constraints of a $5,012,000,000 budget plan, we have provided for these priority needs--but have been able to provide for none of them at the needed levels of support. There will be no margins and no back-up hardware. Any failure on test or other setbacks will mean that one or the other of these priorities will suffer.

With regard to the manned flight effort, we are this year beginning the first flight activity in Apollo, starting with sub-orbital and earth-orbital tests with the Saturn 1B. By next year, we expect to have tests of the Saturn V launch vehicle, which will provide an operational capability for our manned lunar landing or for manned synchronous orbital operations over long periods. The FY 1967 funds budgeted for this effort will, we believe, be sufficient to maintain the schedules needed to carry out a manned lunar landing and return before the end of the decade--only if we encounter no major failures or unforeseen problems.

As you know, there have always been unanticiapted difficulties in such large projects. Up to now, in Apollo our manned space flight team has been able to solve them or work around them without a major impact upon the program schedules. We

cannot guarantee they will always be so successful. We are carrying out Apollo under the concept of all-up systems testing. This provides more data per flight mission and should reduce the total number of flights needed to qualify the equipment and prove the reliability and effectiveness of the entire system. However, any major failure would require a profound reassessment of our working schedules and of our ability to perform the manned lunar landing in this decade.

Let me repeat that there are no margins of time or of resources to meet the effects of setbacks. We will be working on a "success" schedule, which we are willing to undertake because Saturn I flew ten flights without a failure, we have successfully completed the Apollo abort tests, and we have fired all the stages of the operational Apollo vehicles. The first Saturn IB sub-orbital flight was under the all-up concept and it met all of its objectives. We believe our management team and management approach have demonstrated their effectiveness, but we must point out that there is no leeway left. As we enter into this next phase of heavy flight activity, we will need your full support as well as our own perseverance and dedication.

In the area of space science and applications, we have cancelled the AOSO, but will be able to continue with the other important projects underway, such as the astronomical, geophysical and solar observatories, the Explorer satellites, the Biosatellite, the Lunar Orbiter and Surveyor projects, and the Nimbus and the Applications Technology Satellite. The space sciences are at the heart of our program of space exploration; it is this search for new knowledge and its application to our understanding of the fundamentals of the universe that energizes our technology development and systems to put this technology to work in practical applications.

In 1965 alone, NASA systems brought back from space more new scientific information than had been gathered in the whole previous history of space exploration. We have brought back pictures of the Moon and of Mars and have launched solar and geophysical observatories. In the area of applications, we have completed and turned over to operational users the synchronous communications and operational meteorological satellite systems.

This past summer, the Space Science Board of the National Academy of Sciences undertook an important study of the directions

to which NASA should look in the future, in the realization of its potential for the scientific exploration of space. In several critical areas, the FY 1967 budget does not meet the rates of progress recommended by the Board. Faced with budget constraints, we had to make the difficult decision to terminate the Astronomical Orbiting Solar Observatory project, which was strongly supported by the Board, and not continue the spacecraft design effort into the next phase of flight hardware development. Instead of working toward missions to Mars in the early 1970's based on the Voyager spacecraft system for planetary orbiters, probes, and landers that the Board recommended, we are stretching out this effort and allocating funds in 1967 only for the continuation of the system design. If funds are provided to initiate a major effort on the Voyager program in FY 1968, there is the possibility that we could undertake to launch a landing capsule at the 1973 Mars opportunity. However, the magnitude of the task encompassed by an automated biological laboratory suggests that we have little choice but to defer that mission to the period after 1975. In general, our space science level of activity in FY 1967 will be considerably below that currently underway in FY 1966.

In the advanced research and technology effort of NASA, this budget maintains a broad but restrained level of effort in most areas. We have, however, had to reorient several promising projects away from hardware development or end item goals toward technological investigations. For example, we have terminated the M-1 engine development; we are, however, maintaining an energetic program in investigation of high energy liquid fueled engines. The work on the SNAP-8 system is continuing, but at a slower pace than originally proposed. We are proposing a program of test firings in the large solid motor area. By contrast, we are able to show a total increase in the level of resources applied to aeronautics over last year. Viewed overall, our advanced research and technology program is receiving minimal funding.

In the FY 1967 budget, we propose certain steps to avoid creating a gap in our space activities in later years and to permit, in the FY 1968 budget, consideration to be given to the future programs that our present capability--building missions will make possible.

For example, in the program of planetary exploration we are proposing a Mariner mission to Venus in 1967 and a heavier,

more sophisticated Mariner mission to Mars in 1969. If in next year's budget we obtain support for a Voyager 1973 Mars mission, these two intermediate missions will have provided continuity and important new scientific data in the program areas stressed most forcibly by the Space Science Board.

It is important to recognize the role of the 1967 Mariner-Venus mission in maintaining continuity within the planetary exploration program. The flyby of Venus in 1967 will mark the second U.S. flight to Venus. The exploration of Venus has always been an integral part of the Space Science Board's and of NASA's planning. Studies are currently underway on Mariner missions to Venus in 1970 and/or in 1972. In addition, consideration is being given to Voyager missions to Venus in the 1970's. Results from a successful 1967 mission could influence substantially the approach to be taken on subsequent missions. The Mariner IV flight to Mars has strongly influenced plans for future Mars exploration; a similar flight to Venus has great value for further detail planning for Venus exploration.

In the area of chemical propulsion we now plan one additional firing of a half-length 260" solid rocket motor. This is the lowest level that will preserve the option of undertaking

full length motor development as we develop our post-Apollo program.

Perhaps the most critical gap that we face is in the area of manned space flight. The Apollo applications effort, recommended for funding at a minimum level in FY 1967, represents a major deferral until FY 1968 of important decisions affecting the future.

As you know, Apollo is much more than a manned lunar landing effort; it encompasses an important program of scientific and technological experiments and tests and, most important, is providing a wholly new capability for a wide spectrum of space flight operations. It is the exercise of these capabilities of the Apollo-Saturn systems for new missions of scientific and technological importance that we are calling Apollo applications. The Apollo applications effort represents that next family of major flight missions which we expect to be recommending for approval and authorization in the coming years. We believe that the Apollo applications work is of critical importance since it is necessary to any further definition of a new major goal comparable to that of Apollo itself.

In the application of Apollo systems to new missions in addition to the manned lunar landing, we believe we will develop the hard facts, identify the major problems, and be able to outline a course of action associated with the next major steps of space exploration. There are three basic elements to the Apollo applications effort that we foresee:

We believe we can improve the basic Apollo space vehicle capabilities through minor modifications and thus extend its manned time in orbit from two weeks to 45 days and longer;

We must plan now to procure additional spacecraft and launch vehicles if they are to be available for new, or follow-on, missions beyond the time frame of the current Apollo mission.

If the objectives of a completely reliable system, capable of operating out as far as the Moon, can be developed without a failure; if all work planned for each of the first seven or eight Saturn V missions is successfully accomplished, then we will find that, within the present production effort, there may be up to seven or eight vehicles that could be used for alternate missions in the period 1968 to 1970.

To avoid misunderstanding, two points must be stressed: First, while there is a possibility that some hardware from the current Apollo program may be available for alternate missions--and it is therefore prudent to plan for its most effective use--we must keep in mind that we are today only at the beginning of a major flight effort that includes 27 Saturns and which will require the best use of our resources and the highest management and technological skills, and which may yet prove to require the full complement of vehicles now programmed. I wish to stress that we are making no commitment of any Apollo hardware to missions beyond the manned lunar landing at this time. Second, although we are planning to keep options open for a smooth transition from Apollo to Apollo applications, we know that resource limitations will not permit us to exercise all of these options and we will need to make wise choices.

The task before us, then, is one of definition, particularly the identification of the scientific and technological experiments and operational missions that require the presence of man in space as the observer, manipulator, and experimenter; it is this unique ability that will be at the heart of the decisions taken for the FY 1968 program.

To summarize, the priorities of manned space flight, space sciences and applications, advanced research and technology, and program continuity are carefully balanced within the framework of the President's $5,012,000,000 budget. Any setback, any lack of support will assure that at least one priority cannot be met.

Beyond FY 1967 lie the decisions for FY 1968, for which studies and limited long lead time procurement are essential. The full-scale initiation of project Voyager cannot be longer delayed if its first missions are to be during the 1973 Mars opportunity. At that time, we must consider full-scale initiation of Apollo applications missions, based upon selective definition efforts now u underway. We must consider increases in the levels of effort in other program areas where important work has been done.

It is becoming clear that in FY 1968 the Nation must begin to choose among the major options that the NASA program has provided. This means a heavy workload in the year ahead.

We must identify the major meaningful objectives that will serve as the national focus for the years to come. If such goals are not chosen, our new element of national space power, our successful flight systems, production capability, test and launch facilities, and dedicated organizations will erode away. Much of the value of our investment and the opportunities for its use will disappear. The FY 1967 budget includes barely enough to plan for the decisions of FY 1968.

The budget request under consideration includes by appropriation $4,246.6 million for Research and Development, some $265 million lower than our current operational plan. It is this appropriation that funds the majority of our effort with industry and universities. For Construction of Facilities we are requesting $101.5 million, the necessary investment in laboratories, research facilities, and launch complexes to carry out the agency program. For Administrative Operations, we are requesting $663.9 million, an increase of $52 million over our FY 1966 operating plan. In this appropriation we must cover all of the costs of our in-house team both in our laboratories and development and test centers in the field and at headquarters, and this budget also reflects the cost of

additional personnel which we must add to meet our program commitments. The details of the FY 1967 budget program follow.

Research and Development

The Research and Development budget of $4,246.6 million will be applied as follows: $3,022.8 million for Manned Space Flight, $661.4 million for Space Science and Applications, $278.3 million for Advanced Research and Technology, $279.3 million for Tracking and Data Acquisition, and $4.8 million for Technology Utilization.

Manned Space Flight

The objectives of the Manned Space Flight Program are to continue the development of a national capability to operate with men in space in the vicinity of the earth and at the moon and to make use of man in space operations for the increase of scientific and technological knowledge. The manned space flight programs directed toward these objectives are Gemini, Apollo, Apollo Applications and Advanced Missions.

Gemini

The Gemini budget request for fiscal year 1967 is $40.6 million. This is a decrease of $186 million from fiscal year 1965. The fiscal year 1967 funds will provide for the final hardware deliveries, launch operations and mission support for the last Gemini flights. The two major objectives of the Gemini Program are to provide an extended operational capability for men in near earth orbits; and to develop fully the rendezvous and docking procedures so important to our Apollo Manned Lunar Landing Program.

We have flown eight Gemini flights to date and have been successful in accomplishing nearly all of our planned objectives for these flights: Two men have flown in space for a period of 14 days. An astronaut has emerged from the spacecraft in flight and successfully executed planned operations and maneuvers in space. Two two-manned spacecraft have achieved rendezvous. A two-manned spacecraft has successfully rendezvoused and docked with the Agena target vehicle. The information obtained from these operations in space represents a major step forward in this Nation's manned space flight capability--but, as shown by the events of the Gemini VIII mission, much remains to be done.

The last four flights of Gemini will be directed toward further development of rendezvous and docking techniques, maneuvering in space, and astronaut extra-vehicular activity. In addition to the important space operations demonstrations, Gemini has provided us with scientific and technological data from the experiments conducted by the astronauts. The remaining flights will fly additional experiments of importance to the Department of Defense and the technical and scientific community.

Apollo

The Apollo program continues to represent the largest single effort of the agency. This program in fiscal year 1967 will require an estimated budget of $2,974.2 million. It encompasses the development of large booster systems required for placing manned spacecraft in earth orbits up to synchronous distances and on flight paths to the moon as well as the development of the complex spacecraft that will support men on their flight to the moon and to the lunar surface and return to the earth. In addition, it includes development of the ground systems that support, monitor and control the mission, the construction and operation of the launch and test complexes

and the large industrial base needed to support this major effort.

The budget requested will allow continued ground-based development testing of Apollo spacecraft modules and Saturn Launch vehicles, and provides for the intensive ground and flight qualification testing necessary in preparation for our first manned missions in Apollo systems, scheduled for early in 1967.

Early this year we witnessed the very successful flight test, in a ballistic trajectory, of the Saturn 1B and Apollo Command and Service Module. This was the first flight test of the Saturn 1B launch vehicle, the first flight test of the service module propulsion system, and the first flight test of the command module heat shield. Three more unmanned Saturn 1B and Apollo spacecraft development flights are planned before the end of this calendar year, and the manned Apollo spacecraft development flights in earth orbit will begin early in 1967.

The Apollo spacecraft funding requested is $1,200.6 million for fiscal year 1967. This covers the heavy development test and production activity for the Command, Service, and Lunar Excursion Modules in preparation for manned development flights

on the Saturn 1B early next year and on the Saturn V a year later. Funding requested for the Saturn 1B for fiscal year 1967 is $216.4 million. These funds support continued ground testing, launch vehicle production, and flight test support and operations. It is estimated that $1,191 million will be required in fiscal year 1967 for the Saturn V, the launch vehicle that will be used for the lunar mission. FY 1967 will be a critical period of ground and flight test as well as production of the Saturn V stages and instrument units. The funds requested will support dynamic tests of the entire Apollo Saturn V space vehicle at the Marshall Space Flight Center, static testing of the first and second stages of the Saturn V at the Mississippi Test Facility, and third stage firing tests at the Sacramento Test Facility of the Douglas Company. Fiscal Year 1967 will also be the year that we reach our high rate of production and delivery activity for Saturn V vehicles. The funding we are requesting will support these efforts as well as critical qualification tests of launch complex 39 at the Kennedy Space Center, and the assembly and checkout of the launch support facilities in preparation for the first unmanned Saturn V flight early next year.

The fiscal year 1967 budget estimate for the Engine Development Program is $111 million. These funds will provide field support for the H-1 engine and provide for F-1 and J-2 engine component qualification testing and engineering support. Relatively extensive ground testing of both the F-1 and J-2 engines will be continued to provide as great an assurance as possible that these engines will perform reliably.

Mission Support activity for fiscal year 1967 is estimated to require $255.2 million. More than half of these funds are to provide for the extensive launch, ground and recovery operations necessary to support the Apollo Program. This activity also includes the broad systems engineering and supporting development effort necessary to the successful accomplishment of the manned flight program.

Apollo Applications

Within the Mission Support portion of the budget, limited funding is included for the planning of activity beyond the lunar landing goal of the Apollo program. Although we are not in this budget proposing a new program, it is essential that studies be continued to help define in detail the nature,

content and support required for sensible extensions to current objectives using the capability that has already been developed in the Apollo program. It is also prudent that we not allow our production base to erode.

Examination of the Apollo program indicates that a capability could be developed within a reasonable funding level to capitalize on opportunities that may be afforded to use equipment that may become available if all early Apollo flight missions are successful. Our concept of preparing to use such equipment for alternate missions is part of the Apollo applications program, as is the examination of possible follow-on flight missions.

In fiscal year 1967, the $41.9 million requested for Apollo applications will all be applied to the procurement of long lead-time components and production effort for follow-on Saturn 1B launch vehicles and associated spacecraft. These funds will avoid having a gap in production from the existing production base in future years and thus allow us to hold open the option of continuing flight operations of Apollo hardware. The decision as to whether to exercise the option for continuing manned flight activity beyond Apollo will be a major issue in the fiscal year 1968 budget.

In addition to long lead-time procurement, the definition and development of Apollo application program experiments is being supported through the Space Science and Applications program and the Advanced Research and Technology program. The extension and applicability of Apollo and Gemini experiments is also being examined as well as the study of new operational, medical, and technology experiments.

Advanced Missions

The budget for Advanced Missions studies in fiscal year 1967 is $8 million. The studies can be grouped according to manned Earth orbital, lunar and planetary missions, and launch vehicle studies. In this area we will examine and make trade-off analyses of a number of promising concepts for advanced manned space flight missions. Included are logical extensions of the present programs as well as the development of new ideas and concepts for possible future missions. The studies involve not only technical considerations but also the critical questions of schedules and costs. Planning of this type is essential to sound definition of future activity and, accordingly, provides guidance for the advanced research and technology programs of NASA.

Space Science and Applications

The Space Science and Applications program represents a continuation of our efforts to use space technology for direct benefits to man and to measure and understand the Earth and space around it, the solar system, our galaxy and its neighbors, and interplanetary space. These activities include the areas of physics and astronomy, lunar and planetary exploration, bioscience, meteorology, communications, applications technology, university research activity, and launch vehicle development necessary for carrying out the space flight missions included in this program. In addition to continuing the programs in these various areas, this budget also provides for the experiment definition and design work previously mentioned for the Apollo applications program.

Physics and Astronomy

Of the total request for Space Science and Applications, the Physics and Astronomy program will require a budget of $131.4 million. The objective of this program is to increase our knowledge of the space environment of the Earth, the Sun

and its relationship to the Earth, and the physical nature of the universe. The major activities in this area continue the effort on the solar, astronomical, and geophysical observatories and on the Explorer series of satellites and space probes. During the past year, seven launches were made investigating solar phenomena and measuring particles and fields in the near-Earth environment. The major accomplishment of this activity is the definition of the magnetosphere.

Lunar and Planetary Exploration

The amount requested for the Lunar and Planetary Exploration program is $197.9 million. The immediate objectives of this program include unmanned exploration of the Moon in preparation for Apollo, and investigation of the planets Venus and Mars and of interplanetary space. Approximately two-thirds of the funds requested are for support of the lunar exploration activities. The effort in this area includes the continuation of the Surveyor lunar soft-landing spacecraft and the Lunar Orbiter for mapping wide areas of the lunar surface.

The first Surveyor and Orbiter spacecraft will be launched within the next few months.

One of the outstanding achievements of the year 1966 is the data obtained by the Mariner IV spacecraft in its flight past Mars last summer. The photographs of Mars and the data on its atmospheric density have had a profound effect on the scientific community. The funds requested for Mariner will permit the continuation of this program with a Mariner flyby past the planet Venus during the 1967 opportunity and a flyby mission past the planet Mars during the 1969 opportunity, thereby maintaining the continuity within the planetary exploration program, as I pointed out earlier. The Lunar and Planetary budget includes $10 million for continued definition of the Voyager that will keep open the option to proceed next year with the development of the Voyager spacecraft for an unmanned flight to Mars and the landing of instruments on its surface in 1973.

Bioscience

The funds requested to support the Bioscience program are $35.4 million. The Bioscience program has two primary objectives:

One is to obtain an understanding of the effects of the space environment on living organisms and the other is the search for extraterrestrial life, with primary emphasis directed to the planet Mars. Slightly more than half of the funds are devoted to the Biosatellite project, which is to carry out a series of flight experiments to determine the effects of space environment or life systems. The first biosatellite will be launched late this year. The remainder of the bioscience funding supports instrument definition that will enable us to determine the existence of possible life forms on the nearby planets and to explore the effects of space environment on terrestrial forms of life.

Meteorological Satellites

The work planned to continue the development of technology and to increase the usefulness and capability of meteorological satellites requires $43.6 million. The technology developed in the TIROS R&D program was successfully demonstrated by the two operational spacecraft, ESSA I and II developed and launched by NASA for the Weather Bureau. Both of these satellites are operating effectively and are providing world-wide daytime cloud cover photographs. Continued development of the TIROS system is directed toward a capability of taking cloud cover photographs

during the nighttime as well and combining both the daytime and nighttime photographic capability within a single satellite. The role of Nimbus is to develop and demonstrate various advanced sensors and subsystem equipment too large to fly on TIROS class spacecraft that may be useful in a future generation of operational weather satellites. We had a successful launch of Nimbus II on the fifteenth of May. The program also includes a sustained effort in meteorological sounding rockets to provide continuing information on the atmosphere that can be correlated with the satellite data to assist in further improvements in weather observation and prediction.

Communications and Applications Technology Satellites

The Communications and Applications Technology Satellites program has a budget of $26.4 million. The major portion of these funds support the Applications Technology Satellite project and the associated research and technology activity. The Applications Technology Satellite has as its objective the development of spacecraft technology particularly related to space applications and provides a capability for experimental testing of engineering techniques and communications, meteorological, and other applications systems in the space environment.

It will also provide basic technical scientific data on gravity-gradient stabilization systems for satellites. This engineering and scientific knowledge is needed for reliable engineering design and long-life time capability of future scientific and applications satellites. The first flight of the Applications Technology Satellite is scheduled for late this year.

The communications activity is wholly devoted to ground-based research and technology. The purpose of this work is to assure that the technology required for the establishment of future communication satellite systems is being developed, and to assess the applicability of satellites to the future needs of communications systems. The program also includes continued experimental and data analysis work related to operation of the RELAY and SYNCOM communication satellites.

University Program

The budget requested for the Sustaining University Program is $41 million. These funds will enable us to continue our work with a large number of universities in developing their capability and participation in building up pre-eminence for this Nation in aeronautics and space-related science and technology. Approximately half of these funds will be used to support on-going

training activities in over 140 graduate schools to increase the supply of highly trained scientists and engineers in fields related to space science and engineering. Slightly more than one-fourth of the funds requested will support university research in fields of space and aeronautics. The remainder will support the construction of needed laboratory space at those universities that are already heavily committed to space related training and research activity.

Launch Vehicle Development

The Launch Vehicle Development program will require a budget of $33.7 million, of which $29.7 million will be used to complete the development of the Centaur launch vehicle. The remaining funds provide for the continuation of unmanned launch vehicle studies and the development of new technology. Such work is important to develop an understanding of the performance requirements of future launch vehicles, to determine the best methods for improving existing launch vehicles to obtain the needed performance gains, and to develop new technology and techniques for incorporation into existing and future launch vehicle systems.

The procurement of light and medium launch vehicles, namely the Scout, Delta, Agena, and Centaur, will require

$152 million. These vehicles are required to support all of the space science, applications and advanced research and technology flights using such launch vehicles. These funds also provide for the sustaining engineering and maintenance effort for improving the performance and operating capabilities of these launch vehicles as dictated by mission requirements through the application of the technology and methods derived from the launch vehicle study and technology development activities.

Advanced Research and Technology

The advanced research and technology effort constitutes a continuing program to support the current aeronautical and space activities of the Nation, and to provide the scientific and engineering bases necessary to undertake future programs in these areas. Much of this effort is conducted in the laboratories of NASA in close association with advanced engineering and technology work in universities and in industry. The budget required to support this activity in fiscal year 1967 is $278.3 million.

The budget request is divided among the various areas of advanced research and technology: Basic Research, $23.0 million;

Space Vehicle Systems, $36.0 million; Electronic Systems, $36.8 million; Human Factor Systems, $17.0 million; Space Power and Electric Propulsion Systems, $42.5 million; Nuclear Rockets, $53.0 million; Chemical Propulsion, $37.0 million; and the Aeronautics program, $33.0 million.

There have been a number of significant accomplishments in the Advanced Research and Technology program during the past year. The most noteworthy of these include the completion of two successful firings of the 260-inch diameter large solid motor; completion of fullpower NERVA tests and the initiation of nuclear reactor engine system tests; completion of successful operation of all the major components of SNAP-8; successful completion of project FIRE; reentry communications demonstrations; and the successful launch of the second Pegasus meteoroid spacecraft. In addition, there are a number of significant on-going programs in support of the advances research and technology objectives which have made considerable progress this past year and which will continue in FY 1967. These include the space vehicles research on the effects of space radiation; the research on lifting bodies; the development of advanced liquid rocket engine technology; the increased electronics research activity at the Electronics Research Center; and a continuing basic research program.

Aeronautics

NASA is responsible for establishing a base of research information in aeronautics that will provide the data needed to satisfy design and operating requirements of all segments of aviation, including the military services and the Federal Aviation Agency. This work is funded at a total level of approximately $123.5 million in the current NASA budget. The work extends from vertical take-off aircraft through supersonic aircraft and propulsion system technology, to the establishment of the technology that will ultimately be required in hypersonic aircraft flight.

In fiscal year 1967, the V/STOL program will receive increased emphasis. Research in support of the supersonic transport will continue with a program including full scale research on advanced engine components and complete engine systems. The research project utilizing the B-70 aircraft, to be started this year, will continue with the objective of providing basic research data on the performance and operating characteristics of large supersonic aircraft. This flight research activity will be supplemented by an active on-going ground-based aeronautics research program. Research in aircraft operating problems, particularly aircraft noise, will increase.

The research program to investigate hypersonic flight in the range of Mach 6 will continue to establish the propulsion and aerodynamic principles for application to future hypersonic aircraft.

Tracking and Data Acquisition

The Tracking and Data Acquisition program supports all of the manned and unmanned flight missions of NASA. This includes tracking to determine the position and trajectory of vehicles in space, acquisition of data from scientific experiments and data on the performance of spacecraft and launch vehicles, transmission of commands from the ground stations to spacecraft, communication of information between various ground facilities and mission control centers, and processing of the data acquired from the space vehicle. The funds required to support this activity for fiscal year 1967 are $279.3 million. Of this amount $199 million is required to operate the world-wide system of ground stations and $66.5 million is required for necessary station equipment. The remainder is for the development of advanced systems, components, and techniques for future use in improving the reliability, flexibility, and capability of the tracking and data acquisition stations.

Technology Utilization

The primary objective of the Technology Utilization program is to provide for the widest practicable and appropriate dissemination to aerospace and non-aerospace industry, of information with potential industrial applications derived from NASA activities. Through this activity of information dissemination the industry of this Nation is provided with unique opportunities to improve existing industrial techniques and to develop new products and methods. To support this activity effectively, $4.8 million is requested. These funds support the three areas of activity that comprise the Technology Utilization program. These are: the search for ideas, innovations, processes and techniques that appear to have potential for non-aerospace application; the evaluation of this information for novelty, technical feasibility and relevance to the non-aerospace industry; and the dissemination of this information to U. S. industry.

Construction of Facilities

The appropriation requested for Construction of Facilities in fiscal year 1967 is $101.5 million. This budget request provides for $94.5 million for facility construction and $7.0 million for facility planning and design.

Of the $94.5 million requested for construction, $43.3 million is for facilities required for the direct support of Apollo. The major element of these facilities is the $29.5 million required to complete the Saturn V Launch Complex 39 at the Kennedy Space Center. Another important facility is the $9.1 million Lunar Sample Receiving Laboratory. This facility will provide for the quarantine of the astronauts and lunar surface material following manned lunar landing flights. Other necessary Apollo construction includes testing and support facilities for the Saturn V launch vehicle stages at the Mississippi Test Facility and various locations and additional crew training capability at the Manned Spacecraft Center.

In addition to the Apollo facilities there are $5.4 million of other construction required to support currently approved programs. These include modifications to the unmanned spacecraft and launch facilities at the Kennedy Space Center and the Western Test Range, an additional sounding rocket storage magazine at the Wallops Station, and a facility for testing tracking antenna equipment at the Goddard Space Flight Center.

Approximately $31.9 million of the Construction of Facilities budget is to provide for increased technical capability at the

NASA Centers to carry out the research and technology effort of the agency. Of this, $8 million is for the continued development of the Electronics Research Center, and $14 million is for the expansion of the Propulsion Systems Laboratory at the Lewis Research Center to provide the necessary capability for full scale research on advanced air-breathing engine components and engines related to the development of the supersonic transport airplane. The remaining facilities for increased technical capability are for research on hypersonic air-breathing engines, small rocket engines, V/STOL aircraft and space vehicle flight instrumentation systems.

The remaining $13.9 million requested for Construction of Facilities is to provide service facilities required to support the new facilities and to continue effective operation of existing facilities. This category is comprised of supporting utilities, extended storage and office space, and additional heating and refrigeration plant capacity.

The facilities that we are requesting have been pared down to the minimum essential for adequate support of the various program activities. Any reduction in this area will require the elimination of some essential support facilities, thus impairing those elements of the program that they support.

Administrative Operations

The appropriation requested for "Administrative Operations" in fiscal year 1967 amounts to $663.9 million. We anticipate a total of 34,939 positions by the end of fiscal year 1967, which is 415 more than fiscal year 1966. An additional 450 positions are planned for the Electronics Research Center in accordance with the phased buildup for that installation. Also an additional 365 positions are planned for the Kennedy Space Center and the Goddard Space Flight Center to support the heavy emphasis on launching and tracking of the manned space flight missions. This increase of 815 positions will be offset by a target reduction of 400 positions throughout the agency which will not be filled upon becoming vacant and results in a net increase of only 415 positions over fiscal year 1966.

The administrative operations funding estimates were prepared on a minimum basis. The level of NASA staffing and other administrative support activities essential to the operation of our centers and conduct of the program will not permit any reduction in this area.

It is estimated that the funds required in fiscal year 1967 will exceed the fiscal year 1966 requirement by $52.1 million. The major reason for the increase is related to the manned lunar

landing program with the Cape Kennedy Merritt Island Launch Area approaching its full development and the Manned Spacecraft Center approaching its full operational capability, as well as the support of this program in other centers, particularly the Goddard Space Flight Center. Our personnel costs are estimated at $402.4 million in fiscal year 1967 and represent the largest cost element of the "Administrative Operations" budget. This represents a net increase of $21.6 million over our requirements in fiscal year 1966; $3.8 million of this increase is caused by the full year effect of the Federal Employees Salary Act of 1965, effective October 1965; $9.8 million is attributable to the additional 846 manyears to be realized from the full year employment of personnel added during fiscal year 1966, and from the part-year employment of the additional positions requested for fiscal year 1967; the remaining $8.0 million of this increase is required for reimbursement to the Department of Defense for military personnel detailed to NASA ($1.1 million) and to fund the structural changes in the personnel complement ($9.9 million), offset by decreases in temporary employment ($.4 million) and in overtime and holiday pay ($2.6 million).

We are requesting an increase of $20.0 million in "Other

Services", primarily resulting from program development and the completion of new construction begun in prior years. The largest portion of the increase for other services is to support the expanded activity at the Kennedy Space Center and amounts to $9.8 million. The balance of this increase amounts to $10.2 million and is required for the following: $2.4 million for technical documentation and scientific and technical information programs, occasioned by the advancement in the Apollo program from design and development effort to testing, qualifications and flight; $2.7 million for increased requirements to ADP programming, operations support, and maintenance, primarily to support the Electronics Research Center and the tasks conducted by the Goddard Space Flight Center Institute of Space Studies; $3.7 million to support the increased costs of maintenance and custodial services; and the remaining $1.4 million of this increase is required to fund minor changes in all other categories of service.

The balance of the increase for "Administrative Operations" in fiscal year 1967 of $10.5 million is required as follows: $.4 million increase in travel and transportation costs are required to support the growth of Electronics Research Center and the increased flight activity at Kennedy Space Center and

Manned Spacecraft Center; an additional $.4 million is requested in transportation of things primarily to support the expansion of personnel and facilities at the Merritt Island Launch Area and Launch Complex 39 at Cape Kennedy as the Apollo program moves into the flight stage; a $6.6 million increase in rents, communications and utilities is required to fund increased space rental at the Electronics Research Center, increased rental of ADP equipment, increased communications, and increased utilities of which $2.7 million is required to fund ADP leases, $.5 million for rental of space, $.6 million for communications, $2.7 million for utilities, and $.1 million for all other items in this category; printing and reproduction costs are increasing by $.3 million to support the growing volume of scientific and technical information being generated by our research and development programs, and the statutory requirement to make this data available to the scientific community; a $5.0 million increase in supplies and materials is required primarily to support the larger number of facilities which will become operational, and the increased number of civil service and contractor personnel as the Apollo program progresses; and a minor increase of $.1 million is required for lands and structures to support the expansion of the Apollo flight

activity. A net reduction of $2.3 million in the cost of equipment will partially offset these increases in fiscal year 1967 to arrive at the $10.5 million increase. This reduction is directly attributable to the reduction in the ADP equipment purchase program, which has been reduced from $7.9 million in fiscal year 1966 to $2.8 million in fiscal year 1967. This reduction in equipment is partially offset by an increase of $2.1 million to support the buildup required for manned flight support operations and $.7 million for modernization of our laboratory equipment.

Concluding Remarks

This budget recommended for fiscal year 1967 is austere, but will permit us to proceed with our current balanced program on a success basis. We will be able to continue our studies toward fiscal year 1968 decisions as to how we will use the space capabilities in the future. To accomplish what the Nation needs in 1967 requires your full support of the budget request and our utmost care in handling our resources.